

## 2.0 Environment Overview

### Category: New User Orientation

Our HPC environment is operated by staff in the NASA Advanced Supercomputing Division at Ames Research Center located at Moffett Field, CA. The supercomputers and support staffing are funded by NASA's High-End Computing Capabilities (HECC) Project.

The sections below summarize the overall supercomputing environment, including secure network connections, front-end systems, and data storage facilities.

### 2.1 Capabilities and Components

The HPC environment provides the following capabilities and components, including integrated supercomputing support services, augmented by customizable support throughout the entire life cycle of your projects.

#### 2.1.1 Secure Enclave

The enclave is a secure, networked area containing the following:

- High-performance computers (HPCs): Pleiades and Columbia
- Visualization system: hyperwall-2
- Secure front-end systems (SFEs) - provide inbound connection to the HPCs; two-factor authentication using your RSA SecurID fob is required when issuing commands such as **ssh**, **scp**, and **bbftp** for inbound connection via the SFEs
- Secure Unattended Proxy (SUP) - allows remote file transfers and other remote operations without typing a password and using your SecurID fob; instead, you can pre-authenticate, which allows automatic file transfers
- Mass storage systems (Lou1 and Lou2)

#### 2.1.2 Supercomputers

The high-end computers at the NAS facility currently include Pleiades and Columbia. Brief system descriptions with links to more detailed configurations are given below.

Keep in mind that you have been given access to and allocations on specific systems - not all supercomputing resources are available for your use.

## Pleiades

The NAS facility's newest system, Pleiades is an SGI Altix ICE 8200 EX cluster containing Intel quad- and hex-core processors.

- 111,872 total Intel cores (Harpertown, Nehalem-EP, and Westmere)
- 3 GHz processor speed (Harpertown), 2.93 GHz (Nehalem-EP), and 2.93 GHz (Westmere)
- 188 terabytes (TB) total memory
- 12 front-end nodes (Pfe1-12) and 2 bridge nodes (bridge1, bridge2)
- 1.315 petaflops (Pflop/s) peak; 1.09 Pflop/s sustained performance (June 2011)

The two bridge nodes, with larger amounts of memory and higher-speed network connections compared to the front ends, offer faster file transfers between Pleiades and Columbia or the Lou mass storage systems. The bridge nodes have 64-bit versions of IDL, MATLAB, and TecPlot installed and will run these applications much faster than on the front-end nodes.

## Columbia

The Columbia system comprises SGI Altix 4700 compute servers contained in 40 cabinets.

- 4,608 Intel Itanium processors (Montecito, Montvale)
- 1.6 GHz processor speed
- 9 terabytes (TB) total memory
- 1 front-end node (cfe2)

### 2.1.3 Visualization System: hyperwall-2

The hyperwall-2 provides users with a supercomputing-scale resource to process very large datasets produced by the HPCs and NASA scientific instruments. Access to this system by general users is limited and requires special authorization.

- 128 high-end NVIDIA graphics processing units (GPUs)
- 1,024 AMD processor cores (Operton)
- 2 terabytes total memory
- Storage: 475 terabytes

### 2.1.4 Networks

To access the HPC resources, use the command **ssh** to connect from your desktop system to either a wide area network (either NREN or NISN) or to a host system to log into the NAS

local area network, which provides access to the enclave via the secure front-end systems.

For remote users, two DMZ servers (DMZFS1, DMZFS2) are available for staging files between the enclave and the outside world. The DMZ offers authentication bastion hosts for accessing internal system resources, and also provides a file staging area for remote users who need to automate their transfers. The DMZ file servers provide limited storage (2.8TB each) for temporary file storage for very short durations. Files older than 24 hours are automatically removed.

Two host systems (Bouncer and Bruiser) are gateways for local NAS users.

See network tools and [file transfer tips](#) for more information.

## 2.1.5 Mass Storage

The NAS high-performance computing environment includes mass storage systems Lou1 and Lou2, with about 45 petabytes (PB) of tape storage and over 7 PB of disk storage on the floor). This capability allow users to archive and retrieve data quickly and securely. Data stored on disk is migrated to tapes as needed.

The diagram below gives an at-a-glance view of the environment and its components.

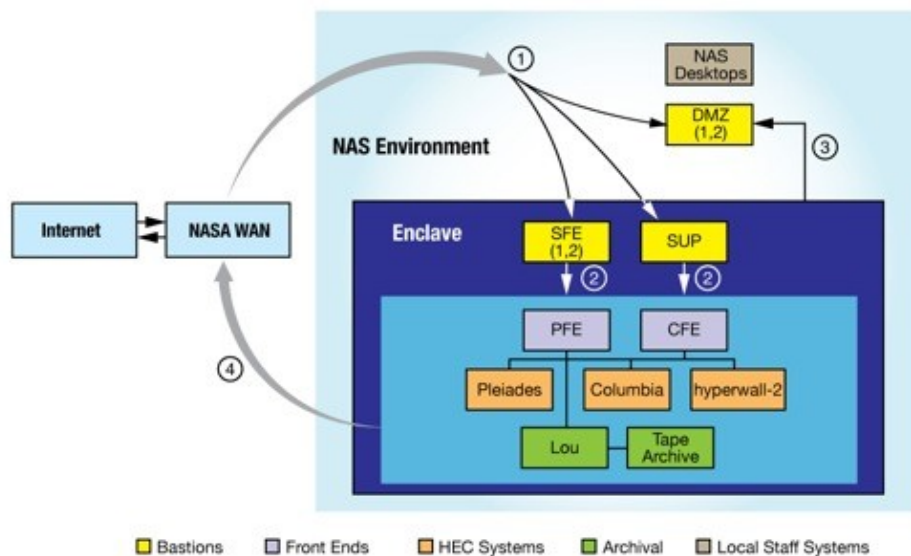


Figure 1: NAS login process. Numbered arrows denote the following: 1) Connect to a NAS bastion, 2) Connect to a front-end system or compute node, 3) Pull files from the Demilitarized Zone filesystem, 4) Traffic leaving NAS, outbound connections.

## 2.1.6 Other Capabilities and Services

The following support services are also offered free of charge to all users.

- Application performance optimization and code porting
- End-to-end network services for troubleshooting and performance
- Advanced scientific visualization and analysis capabilities

NAS User Support staff are available 24x7x365.

**Toll-free Telephone:** (800) 331-8737

**Local Telephone:** (650) 604-4444

**E-mail:** [support@nas.nasa.gov](mailto:support@nas.nasa.gov)

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New User Orientation -> 2.0 Environment Overview

<http://www.nas.nasa.gov/hecc/support/kb/entry/25/?ajax=1>